CLAIMS

What is claimed is:

1. A network switch having a hybrid switch architecture, comprising:

at least two shared-memory switch fabrics, each shared-memory switch fabric being configured to store and retrieve packets; and

at least two crossbar switch fabrics, each crossbar switch fabric being coupled to each of the shared-memory switch fabrics and configured to distribute and re-collect packets to and from each of the shared-memory switch fabrics.

2. The network switch of claim 1, wherein each shared-memory switch fabric is a NxN shared-memory switch fabric , N being an integer greater than 1, and wherein each shared-memory switch fabric includes N inputs for receiving packets and N outputs for sending packets on N channels and wherein at least one channel is coupled to each crossbar switch fabric.

3. The network switch of claim 2, wherein each crossbar switch fabric is a nxm crossbar switch fabric, n being an integer and m being an integer greater than one, and wherein each nxm crossbar switch fabric is coupled to n

ports for receiving and transmitting packets from and to network ports and m channels for distributing and re-collecting packets to and from the NxN shared-memory shared-memory switch fabrics, and wherein at least one of the m channels is coupled with each NxN shared-memory switch fabric.

4. The network switch of claim 3, wherein m is an integer multiple of a total number of NxN shared-memory switch fabrics.

5. The network switch of claim 4, comprising:

a first and second 48x48 shared memory switch fabrics; and

12 8x8 crossbar switch fabrics, each 8x8 crossbar switch fabric is coupled with 4 channels of the first and second 48x48 shared-memory switch fabrics.

6. The network switch of claim 3, wherein the aggregate data rate on the m channels is greater than the aggregate data rate on the n ports for the nxm crossbar switch fabrics.

7. The network switch of claim 5, wherein the NxN connectivity for the shared-memory switch fabrics is greater than the nxm connectivity of the crossbar switch fabrics.

8. The network switch of claim 1, wherein each crossbar switch fabric is a 1xm crossbar switch fabric, m being an integer greater than one, and wherein each 1xm crossbar switch fabric includes 1 port for receiving and transmitting packets from and to a single network port and m channels for distributing and re-collecting packets to and from the shared-memory switch fabrics.

9. The network switch of claim 8, wherein m is an integer multiple of a total number of shared-memory switch fabrics.

10. The network switch of claim 9, comprising:

a first and second 48x48 shared-memory switch fabrics; and

12 1x8 crossbar switch fabrics, each 1x8 crossbar switch fabric is coupled with 4 channels of the first and second 48x48 shared-memory switch fabrics.

11. The network switch of claim 1, further comprising:

a port controller coupled to each of the crossbar switch fabrics and configured to retrieve packets form at least one network port and to forward packets to the crossbar switch fabrics and configured to receive packets from the crossbar switch fabrics and to forward packets to a destination network component via the at least one network port; and

a shared buffer memory coupled to each of the shared-memory switch fabrics configured to store temporarily packets distributed from the crossbar switch fabrics.

12. The network switch of claim 11, further comprising:

a notify ring coupling each port controller, the notify ring configured to transfer forwarding information to each port controller, and wherein the forwarding information is used to request packets from the shared-memory switch fabrics by a port controller.

13. The network switch of claim 1, wherein each crossbar switch fabric is configured to distribute packets directly, randomly, in a round robin, or some other selective manner on an ingress path to the shared-memory switch fabrics such that the distributed packets are stored in the shared buffer memory.

14. The network switch of claim 13, wherein each shared-memory switch fabric is configured to store and retrieve the distributed packets from the crossbar switch fabrics in the shared buffer memory.

15. The network switch of claim 12, wherein each shared-memory switch fabric is also configured to send a packet buffer number indicating where a packet is stored in a shared buffer memory.

16. The network switch of claim 15, wherein each port controller is also configured to generate the forwarding information based on the packet buffer number and switch instance sent from each shared-memory switch fabric.

17. The network switch of claim 16, wherein each port controller is configured to request packets from each of the shared-memory switch fabrics using the forwarding information.

18. The network switch of claim 15, wherein packets are requested from each of the shared-memory switch fabrics based on an availability of a channel, and wherein the packets are capable of being requested in an order different from an order the packets were received by the crossbar switch fabrics.

19. The network switch of claim 18, wherein each crossbar switch on an egress path re-collects the requested packets and transmits the packets on

egress ports in the order the requested packets were received by the crossbar switch on an ingress path before distribution.

20. The network switch of claim 18, wherein re-collected packets are stored in egress buffers, the re-collected packets are capable of being re-ordered in the egress buffers.

21. The network switch of claim 20, wherein each port controller includes:

an egress request queue storing requests to re-collect packets from the shared-memory switch fabrics, and wherein the requests are serviced based on an availability of a channel.

22. The network switch of claim 20, wherein each crossbar switch fabric further includes:

an ingress switching unit configured to receive packets and forward the received packets to channels coupled with the shared-memory switch fabrics; and

an egress switching unit configured to receive requested packets from the shared-memory switch fabrics and forward the requested packets to a port controller.

23. The network switch of claim 1, wherein the packets are data packets for an Ethernet network.

24. The network switch of claim 1, wherein the packets are data cells for an asynchronous transfer mode (ATM) network or for storage area network frames.

25. A network switch having a hybrid switch architecture, comprising:

a plurality of NxN shared-memory switch fabrics, each NxN shared-memory switch being configured to store and retrieve packets and wherein N in an integer greater than 1; and

at least two nxm crossbar switch fabrics, each nxm crossbar switch fabrics coupled with each NxN shared-memory switch fabric and configured to distribute and re-collect packets from each NxN shared-memory switch fabric and wherein n is an integer and m is an integer multiple of a total number of the plurality of NxN shared-memory switch fabrics.

26. The network switch of claim 25, wherein the total number of the plurality of NxN shared-memory switch fabrics is at least two.

27. The network switch of claim 25, wherein each crossbar switch fabric is coupled with n ports for receiving packets from a source network component on an ingress path and for transmitting packets to a destination network component on an egress path and m channels for distributing and re-collecting packets to and from the plurality of NxN shared-memory switch fabrics.

28. The network switch of claim 27, wherein each NxN shared-memory switch fabric is coupled to one of the m channels.

29. A method of using a network switch having a hybrid switch architecture, the method comprising:

distributing packets received by an ingress crossbar switch fabric to at least two shared-memory switch fabrics; and

storing the distributed packets from the ingress crossbar switch fabric in a shared buffer memory associated with each shared-memory switch fabric.

30. The method of claim 29, further comprising:

removing header or control information from received packets before distribution.

31. The method of claim 29, wherein distributing packets distributes packets directly, randomly, in a round robin, or some other selective manner to the shared-memory switch fabrics.

32. The method of claim 29, further comprising:

sending a packet buffer number and a switch instance for each packet stored by each shared-memory switch fabric to an ingress port controller, the packet buffer number including information indicating where the packet is stored in the shared buffer memory and the switch instance including information which shared-memory switch fabric stored the packet.

33. The method of claim 32, further comprising:

generating forwarding information using the packet buffer number and switch instance; and

sending the forwarding information to an egress port controller via a notify ring.

34. The method of claim 30, further comprising:

requesting packets from the shared-memory switch fabrics by an egress port controller using the forwarding information from the ingress port controller; and

re-collecting the requested packets from the shared-memory switch fabrics by the egress port controller.

35. The method of claim 34, further comprising:

retrieving the requested packets from the shared buffer memory by the shared-memory switch fabrics; and

transmitting the packets to a destination network component in an order the packets were received by the ingress port controller.

36. The method of claim 30, further comprising:

requesting packets form the shared-memory switch fabrics by an egress port controller based on an availability of a channel regardless of an order the packets were received by an ingress port controller; and

re-collecting the requested packets by the egress port controller; and

re-ordering the re-collected packets such that packets are to be transmitted to a destination network component in an order the packets were received by the ingress port controller.

37. A network switch having a hybrid switch architecture comprising:

at least two shared-memory switch fabrics;

a first crossbar switch fabric configured to distribute received packets to the at least two shared-memory switch fabrics;

a shared buffer memory associated with each shared-memory switch fabric and configured to store packets from the first crossbar switch fabric; and

a second crossbar switch fabric configured to re-assemble the packets stored in the shared buffer memory associated with each shared-memory switch fabric.